



DEPARTAMENTO DE
ANÁLISIS MATEMÁTICO Y
MATEMÁTICA APLICADA



SEMINARIO DE ANÁLISIS MATEMÁTICO Y MATEMÁTICA APLICADA

Andrés Fraguera Collar
Autonomous University of Puebla, Mexico

Some mathematical models of the mechanical and electrical activity of the heart: forward and inverse problems

At the beginning of the lecture we introduce a lumped parameter models that describe the hemodynamic state of the cardiovascular system and we will use it to describe the heart mechanical cycle and to study the conditions under which the existence of certain particular types of solutions can be demonstrated that correspond to the four cardiac phases: isovolumetric contraction, ejection, isovolumetric relaxation and ventricular filling.

Next, we will use the monodomain model for an isolated ventricle, which allows us to find certain relationships between the parameters of the ionic currents and the diffusion matrix that ensure the existence of periodic solutions associated with the heart rhythm. These relationships allow us to draw some conclusions about the transition to arrhythmia in the case of some anomalies such as Brugada Syndrome.

Finally, it is shown that the solutions of the two-domain model coupled to the torso can be approximated by solutions of approximations of the Faedo-Galerkin type, which has implications in the solution of the inverse electrocardiographic problem.

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